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A Study on the Recruitment and Job Performance of Newly Recruited Product Designers and Their Implications in Design Education

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Abstract

One of the key issues for managerial staffs to select the best personnel from numerous job applicants. This study used a questionnaire to ask both the design managers of manufacturing companies and the managers of design companies regarding the methods and criteria used to recruit new industrial designers, as well as

surveying their satisfaction with the job performance of newly recruited industrial designers. The relationship between the method used to recruit new industrial designers and manager satisfaction with the job performance of newly recruited industrial designers was also explored. We hope that the results presented here can provide a reference for assisting the related managers in selecting appropriate new industrial designers for firms and design educational line to create suitable curriculum and teaching contents to adequately equip novice designers for their work. The essential findings of the study are:

1. All the companies use face-to-face interview in the recruitment of industrial designers, 97% companies use portfolio, 38% adopt written test of aptitude test and English, and 16% adopt the right on the spot test of project design. The companies adopt written tests are the manufacturing companies of which the test is required to every newly recruited employee while only design companies have the right on the spot test to check the ability of the applicant in sketching and computer-aided design.

2. The top five criteria in the recruitment of new industrial designers are creativity, product form design ability, design quality, awareness of design trend, and sense of aesthetics; the lowest five criteria are having certificates of design skill, having award winning records, other specialties, knowledge of marketing strategy, and educational background. There exist significant differences of selection criteria among managers with different backgrounds, firm scales and business types.

3. The three performance items of newly recruited industrial designers that managers satisfy the most are schedule control ability, sense of aesthetics, and computer aided design software manipulating ability; the three worst items are free hand sketch, knowledge of engineering & manufacturing, and product planning abilities. There exist significant differences in the manager's satisfaction toward newly recruited industrial designers' job performance among different ways of recruitment.

Keywords: Industrial Designers, Personnel Recruitment, Recruitment Method, Job Performance

1. Introduction

In the current changing environment, enterprises must be able to respond rapidly to change. Such ability to respond frequently depends upon the quality of enterprise personnel. Therefore, the competitiveness of modern enterprises almost equals the competitiveness of enterprise personnel (Werther and Davis, 1993). Excellent personnel perform tasks well and will significantly impact team effectiveness (Drucker, 1964). New product design and development requires integrating the elite in a company but it is difficult to find suitable R&D personnel. However, it is important to recruit such personnel if possible. It is unwise to stifle talented personnel (Ulrich and Eppinger, 2000). Industrial designers play a key role during the new product design and development stages of enterprises, and are a key human resource. In implementing product development strategy, Baxter (1995) claimed that suitable personnel should be placed in a suitable position at a suitable time. Otherwise, all of the efforts expended in planning, equipment, and investment will be in vain.

A survey conducted by CEPD demonstrated that numbers of industrial designers will be unable to meet demand during the coming eight years (CEPD, 2003). Furthermore, according to CIDA (2003), the annual demand for industrial designers in the Taiwan market is about 600~800. Currently, more than 1300 industrial design graduates leave college every year. On the surface it thus seems that the supply should exceed the demand, but enterprises still claim to have difficulty in finding proper personnel (Weng, 2003). Wang (2003), creativity superintendent at BenQ, claimed that Taiwan probably produces fewer than 50 graduates per year who are qualified to take charge of practical projects. This demonstrates that despite numerous college graduates entering the job market, enterprises still have difficulty recruiting suitable industrial design personnel. On the other hand, when recruiting design personnel, managers should effectively judge the suitability of the interviewer; otherwise, managers will suffer considerable trouble when no suitable personnel can be hired.

Few studies have examined the recruitment and job performance assessment of industrial designers. However, appropriate recruitment methods are essential to designer selection and may influence

product designer job performance. This study interviewed managers of industrial design departments in local enterprises and managers of design houses to study the methods and criteria used for recruiting new industrial designers and their satisfaction with the job performance of the newly recruited industrial designers. The relationship between the method used to recruit new industrial designers and manager satisfaction with the job performance of newly recruited industrial designers was also studied. The analytical results can provide a reference for the relevant managers in selecting appropriate new industrial designers and for use in education design to create suitable curriculum and teaching contents to equip novice designers for the requirements of the job.

2. Literature review

2.1. Recruitment for industrial designers

Recruitment is a process through which an enterprise attracts individuals with suitable job knowledge and ability. Therefore, whether an enterprise can recruit high quality personnel depends on proper recruitment procedures (Werther and Davis, 1993). Appropriate and prudent recruitment will also improve enterprise image by giving the interviewers a feel of the severe attitude in hiring new personnel. DeCenzo and Robbins (1994) claimed that the recruitment procedure includes initial interview screening, completing the application form, general interview, background check, job offer, physical check, and permanent employment. Werther and Davis (1993) classified the recruitment methods used by industrial designers into written tests, interviews, and project design. Lin (2002) noted that the methods available to design houses in Taiwan for recruiting new industrial designers include face-to-face interview, portfolio check, and project design. Project design indicates tests that require interviewers to use computers, drawing sketches, rapidly process designs, and other similar tasks. Consequently, this study divided the recruitment methods used by industrial designers into four classes: written tests, face-to-face interviews, portfolio checks, and project design.

2.2. Ability and Knowledge for industrial designers

Teng (1999) and Stark et al. (1986) identified the abilities and criteria that professional designer should possess from both the theoretical and industrial perspectives (see table1).

Table 1 Criteria for professional designer

Criteria	Intension
Concept ability	Basic skills that the speciality needs to posses
Technological ability	Technological ability of foundation that professional need possesses
Ability of the background knowlege	Understanding to the society, economy and culture
Communication ability	Communicate with others through many kinds of methods
Combine ability	Combine the ability, such as concept, background knowlege, technology and communicating, in order to make effective decision
Adaptive ability	Adapt to society that improve fast, and at school professional ability learnt apply to the working practice
Professional attitude	Market competitiveness , speciality discern , the motive of professional ethics and lasting study

Additionally, during stages of product development, industrial designers should not only possess prior a detailed knowledge of design related skills but should also possess knowledge regarding marketing decisions, production, and integration and communication ability (Lin, 2002). He (1996) claimed that the primary skills for designers are creative thinking, ability to design product form, design presentation, aesthetic sense, evaluation ability and analytical ability. Yeh (2002) further observed that industrial designers should possess the following abilities: problem definition, creativity, product planning, valuation, communication and presentation, CAID skills, and independent problem solving ability. Yeh (2000) also identified the following abilities as important for industrial designers: CAID skills, problem solving, creativity, communication and coordination, knowledge of marketing strategy, international perspectives, product form design skills, mechanical and structural design abilities, ability to develop design ideas, and product planning abilities. Finally, Wang (2001) stressed

foreign language abilities and knowledge of human factors for meeting the requirements of internationalization and human factors design.

Luh (2004) and Young (2002) identified the abilities that design graduates should possess from both the theoretical and industrial perspectives. Luh and Young divided the dispositions of industrial designers into attitudes and abilities. Industrial designer attitudes can relate to teamwork, design quality, self-confidence, novelty of design, aesthetic sense, patience and perseverance. The abilities of industrial designers include creativity, keen sense of observation, awareness of design trends, idea sketch ability, verbal presentation ability, product analysis and planning ability, ability to work independently, and ability to generate proper product forms, colors and textures. From this perspective, industrial designers in an enterprise should possess numerous dispositions to be effective participants in product design and development activities. Consequently, Lin (2002) induced seven criteria for use by design houses in recruiting new industrial designers: enthusiasm, communication, desire to learn, cooperation, sketches ability, creativity, and aesthetic sense. Table 2 lists the articles of criteria for the recruitment of industrial designers.

Table 2 Articles of criteria for the recruitment of industrial designers

Article	Criteria
He (1996)	Product form design skills, Creativity, Presentation ability, Aesthetic sense, Product analysis and planning ability
Yeh (2000)	2D and 3D software ability, Design problem solving ability, Creativity ability, Product design idea presentation ability, Knowledge of marketing, Product form design skills
Wang (2001)	Software ability, Problem solving ability, Awareness of design trends, Creativity, Idea presentation ability, Knowledge of marketing, Product form design skills, Foreign language, Ergonomic knowledge
Lin (2002)	Product analysis and planning ability, Design idea presentation ability, Machining and manufacturing knowledge, Knowledge of marketing
Yeh (2002)	Problem solving ability, Presentation ability, 2D software ability, 3D software ability
Yang (2002)	Team work, Quality of design work, Self-confidence, Novelty to things, Aesthetic sense, Desire of learning, Patience and perseverance, Idea sketch ability, Product form design skills, Product analysis and planning ability, Presentation ability, Machining and manufacturing knowledge, Knowledge of marketing, Problem solving ability, Awareness of design trends, Creativity

Lin (2002)	Educational background, Work experience, Specialties, Certificates of design skills, Foreign language, Awards received, Work enthusiasm, Desire of learning
Luh (2004)	Team work, Quality of design work, Self-confidence, Novelty to things, Aesthetic sense, Desire of learning, Patience and perseverance, Idea sketch ability, Product form design skills, Product analysis and planning ability, Presentation ability, Machining and manufacturing knowledge, Problem solving ability, Awareness of design trends, Creativity

2.3. Criteria for evaluating the job performance of industrial designer

Job performance means a person can demonstrate their abilities when performing physical or mental activities (Gerhart and Milkovich, 1990). Moreover, job performance assessment describes how enterprise management record the job performance of subordinates and other related situations, and grade overall personnel performance following a certain period (Jac, 1995). Because industrial design is a highly specialized activity, it is difficult to establish standard evaluation criteria (Ulrich and Eppinger, 2000). For example, Chang and Chen (2000) claimed that in dealing with job performance assessment, the characteristics of new product development should be carefully considered and should not be processed in the same manner as production or business departments. Additionally, Cheng (1998) observed that in Taiwanese enterprises and design houses, monitoring of designer performance stresses design project output; that is primarily a sort of target management. As far as the evaluation of industrial designer's job performance is concerned, Wang (2001) mentioned seven items of job performance criteria for junior industrial designers, including product form, free hand sketching ability, personal disposition, product planning ability, knowledge of engineering and manufacturing, ability to use design software, and ergonomic knowledge. Furthermore, Lin (1997) argued that the assessment of the job performance of industrial designers relies on continuous management assessment of the job quality, efficiency, and control of the design objectives of new designers. Emphasis should be placed upon whether the newly entered designers can cooperate with other team members, their enthusiasm for work, aesthetic sense, analytical ability and creativity in solving design problems, and execution ability.

Based upon Wang's seven criteria regarding the professional ability of junior industrial designers and Lin's evaluation methods for industrial designer job performance, ten criteria were selected for evaluating the job performance of new industrial designers, as listed in Table 4.

Table 3 Criteria for evaluating the job performance of industrial designer

No	Item	Description
1	Product form	The ability in dealing with the product form, color, and texture related to the function.
2	Free hand sketching ability	The ability to present ideas with sketches quickly, clearly, and fluently.
3	Creativity	Define and solve the problem with creative thinking, an overall creative performance.
4	Personal disposition	Be aggressive and optimistic and curious about things; be able to work together as a team for design project.
5	Aesthetic sense	Be sensitive to arts, humanities, fashion, and design trends.
6	Product planning ability	Be able to solve the problem in a systematic and reasonable way.
7	Knowledge of engineering and manufacturing	Be able to process the engineering drawing for final form and model and possess knowledge of manufacturing procedure and material machining.
8	Ability to use design software	Be able to use computers for 2D graphics and layout and construct the 3D models covering product form, color, and texture.
9	Human factors knowledge	The ability to deal with 2D and 3D interface of product; be able to integrate the relations between anthropometrical data and dimensions of the product.
10	Schedule control ability	Be able to control job and schedule.

3. Method

This study used a questionnaire to explore the recruitment and job performance of new industrial designers. The primary phases of this study include literature review, questionnaire format design, survey, results analysis, and discussion. Earlier sections demonstrate that literature review covers the recruitment and criteria for selecting industrial designers and criteria for evaluating the job performance of industrial designers.

According to the above ideas from Table 2, the authors grouped the criteria used for recruiting industrial designers into three dimensions (background, professional ability, personal disposition) and 27 items (see Table 4) in the questionnaire.

Table 4 Dimensions and criteria for the recruitment of industrial designers

Dimensions	Criteria of selection
Background	(1) educational background, (2) work experience, (3) specialties, (4) certificates of design skills, (5) foreign language, (6) awards received
Professional ability	(7) idea sketch ability, (8) product form design skills, (9) product analysis and planning ability, (10) presentation ability, (11) ergonomic knowledge, (12) 2D software ability, (13) 3D software ability, (14) machining and manufacturing knowledge, (15) knowledge of marketing, (16) problem solving ability, (17) awareness of design trends, (18) creativity
Personal disposition	(19) team work, (20) quality of design work, (21) self-confidence, (22) novelty to things, (23) aesthetic sense, (24) optimistic and ambitious, (25) work enthusiasm, (26) desire of learning, (27) patience and perseverance

Based on the literature review, the questionnaire is designed to comprise four parts. The first part deals with business types and the recruitment of industrial designers in enterprises, scale of organization, and methods used for recent recruitment of industrial designers. The second part demonstrates the importance of the criteria enterprises use for recruiting new industrial designers. Three dimensions are considered: background, professional abilities, and personal disposition, each of which contains several detailed questions, for a total of 27 questions. Subjects are required to provide scores of 1, 2, 3, 4, 5 to indicate "not important at all", "not important", "fairly important", "very important", and "extremely important" in response to every question. The third part considers manager satisfaction with the job performance of new industrial designers. Ten items for evaluating job performance are product form, free hand sketch, creativity, personal disposition, aesthetic sense, product planning abilities, knowledge of engineering and manufacturing, ability to use design software, human factors knowledge, and scheduling ability. The subjects were

asked to respond with the numbers 1, 2, 3, 4, 5 to indicate whether they were "not satisfied at all", "not very satisfied", "fairly satisfied", "very satisfied", or "extremely satisfied" with the job performance of newly hired industrial designers. Finally, the subjects were asked to provide basic demographic data about themselves, including gender, age group, educational degree, and title. To ensure the validity of the questionnaire format, a pilot study was performed, and portions of the text of the survey were revised accordingly.

The survey was conducted from February to March, 2004 by mail. 91 design houses registered in CEPD and 200 enterprises from the 104 employment website (2003) that were seeking industrial designers, as well as 140 companies from the top 1000 manufacturers listed in Common Wealth (2001) that primarily produced consumption goods and information products were selected as the sample population. Managers in product design departments and those who had conducted face-to-face interviews of new industrial designers were interviewed. The newly hired industrial designers are defined as those who had obtained bachelor's degrees, and who had less than two years of work experience. Totally, 431 copies of questionnaires were sent and recalled by telephone and postcard. Finally, 93 copies valid questionnaires (21.6%) were returned. Table 5 lists the background data of the subjects.

Table 5 Statistics of the subject's background

Item	Property	No. of persons	%
Gender	Male	82	88.17
	Female	11	12.90
Age groups	25-30 years	15	16.10
	31-35 years	21	22.58
	36-40 years	31	33.33
	41-45 years	19	20.43
	46-50 years	05	05.37
	Over 51 years	02	02.15
Level of education	High school (vocational school)	02	02.15
	Junior college	15	16.12
	College	44	47.31
	Graduate school	32	34.40
Title	Person in charge of a company	18	19.35

	Department chief	37	39.78
	Creativity superintendent	17	18.27
	Senior designer	21	22.58
Business types	OEM mainly	28	30.10
	ODM mainly	28	30.10
	OBM mainly	13	13.98
	Design house	24	25.81
Organizational scale	Below 10 persons	53	56.98
	11-20 persons	36	38.70
	21-30 persons	03	03.22
	31-40 persons	00	00.00
	Over 41 persons	01	01.07

Table 6 Recruitment methods in enterprises interviewed

Recruitment methods	Design department in enterprises (64 copies)	Design house (29 copies)	*Total number (93 copies)*
Face-to-face interview	64 (100.0%)	29 (100.0%)	*93 (100.0%)*
Portfolio check	61 (95.3%)	29 (100.0%)	*90 (96.8%)*
Written test	30 (46.9%)	5 (17.2%)	*35 (37.6%)*
On the spot tests	0 (0.0%)	15 (51.7%)	*15 (16.1%)*

4. Results

4.1. Recruitment methods

Firms usually use two steps for recruiting industrial designers. Table 6 clearly shows that all firms adopted face-to-face interviews in recruiting designers, while 96.8% of them checked applicant portfolios. Additionally, 37.6% of the firms interviewed further conducted written tests, with attitude and verbal tests being required for all newly recruited employees for the personnel resource sector. Only 16.1% of the companies interviewed adopted on the-spot project design tests for ensuring the ability of newly hired industrial designers to meet the company requirements in the area of design work.

About half of design departments in enterprises (46.9%) adopted written tests, while only some design houses (17.2%) used written test.

Only some design houses (51.7%) used on the spot tests to check applicant abilities in sketching and computer-aided design and none of design departments in enterprises did.

4.2. Criteria for selecting new industrial designers

Table 7 shows that the five main criteria enterprises use for recruiting new industrial designers are, in decreasing order of importance, creativity, ability to design product form, quality of design work, awareness of design trends, and aesthetic sense; meanwhile, the five least important criteria are certificates of design skill, awards received, specialties, knowledge of marketing, and educational background.

From the overall dimension of evaluation criteria, the most important one is personal disposition, which was assigned an average score of 4.53, indicating very important, followed by professional ability in second place, with an average score of 4.33. Meanwhile, the average scores of the criteria of ability to use 2D computer software, knowledge of human factors, and knowledge of marketing fell between 3.9~3.0, indicating that they were fairly important to important. Moreover, the scores of other criteria all exceed 3.54, indicating important. For the dimension of background, the average is 3.54. The only exception was certificates of design skill, with a score of 2.92 that less than 3.00, meaning fairly important to not important, and the average scores of other criteria all fell in the range of fairly important to very important. These figures demonstrate that enterprises hope to select new industrial designers based on personal disposition, and professional ability, and ability to match project design requirements. The reason for the criteria certificate of design skill being assigned the lowest importance may be due to the lack of useful certificates of design skill for industrial designers. Therefore, the managers place little emphasis on certificates of design skill.

This study uses independent sample t test and one-way ANOVA to examine the differences among subject types and the relation between business types and criteria for selecting new industrial designers. t-test is used to examine the gender effect and ANOVA is applied to test the effects of age groups, level of education, title,

Table 7 Importance of the dimensions of criteria for selecting new industrial designers

Dimensions	Criteria of selection	Average	Std	Rank	Dimensions		
					Average	Std	Rank
Background	Educational background	3.71#	0.68	23	3.54	0.34	3
	Work experience	3.71	0.70	21			
	Specialties	3.60#	0.70	25			
	Certificates of design skill	2.92#	0.61	27			
	Foreign language	3.71	0.72	22			
	Awards received	3.57#	0.75	26			
Professional ability	Idea sketch ability	4.22	0.88	16	4.33	0.27	2
	Product form design skills	4.90*	0.31	2			
	Product analysis and planning ability	4.23	0.71	15			
	Presentation ability	4.25	0.64	14			
	Ergonomic knowledge	3.79	0.67	20			
	2D software ability	3.95	1.00	19			
	3D software ability	4.68	0.63	7			
	Machining and manufacturing knowledge	4.03	0.83	17			
	Knowledge of marketing	3.69#	0.74	24			
	Problem solving ability	4.57	0.59	10			
	Awareness of design trends	4.78*	0.43	4			
	Creativity	4.92*	0.28	1			
Personal disposition	Team work	4.56	0.65	11	4.53	0.34	1
	Quality of design work	4.84*	0.39	3			
	Self-confidence	4.01	0.75	18			
	Novelty to things	4.30	0.70	13			
	Aesthetic sense	4.74*	0.49	5			
	Optimistic and ambitious	4.38	0.62	12			
	Work enthusiasm	4.61	0.58	9			
	Desire of learning	4.70	0.48	6			
	Patience and perseverance	4.61	0.61	8			

Note: "*" means importance ranked in top 5 and "#" denotes importance ranked in

business types, and organizational scale. The F values and P values demonstrate whether significant differences exist among these criteria. Furthermore, the Scheffé multiple comparison test is applied to different groups to identify the causes for these significant differences (McCall, 1998). Criteria, property of enterprises, and criteria that reach significant differences are shown in Table 8.

Regarding the titles of interviewed subjects, enterprise department chiefs, creativity managers, and senior designers place greater emphasis on the foreign language competence of new industrial designer than managers in charge of design houses do. This phenomenon demonstrates that design departments in enterprises place a greater emphasis on internationalization and designing products for global markets than design house managers do.

Regarding level of education, managers with higher educational backgrounds are more concerned with about the product form design ability and idea sketch ability, while lower educational backgrounds are concerned with the machining knowledge, meaning that managers with higher educational backgrounds ask more about design skills of the newly hired industrial designers.

Regarding gender, male managers tend to emphasize the 3D software abilities of prospective new designers more than female managers do, while female manages emphasize creativity. It indicates that male managers may focus on design techniques, while female managers focus on creativity when recruiting new designers.

In terms of age groups, older managers tend to place a greater emphasis on the 2D software abilities of designers, as well as marketing knowledge, demonstrating that older managers may ask new industrial designers to use 2D graphics for displaying product ideas and are highly concerned with ideas that relate to special marketing strategies.

In terms of business types, managers in enterprises that aggressively design and develop new products, that is, ODM, and OBM business types, and managers in design houses, place greater emphasis on the sketching and team work abilities of new designers than mangers in OEM business types do. It indicates that managers in different types of enterprises will seek different design abilities in newly recruited industrial designers. Regarding organization scale, managers

Table 8 Criteria, property of enterprises, and criteria that reach significant differences

Criteria	Property	Average & ANOVA for recruitment methods	t or F value	P value
Foreign language	Title	Department chief (3.95)>manager in charge of design house (3.28); Creativity superintendent (3.71)>Person in charge of design house (3.28); Senior designer (3.62)>Person in charge of design house (3.28)	3.77	0.016*
Idea sketch ability	Level of education	Graduate school (4.38)>Junior college (3.33); College (4.16)>Junior college (3.33)	4.93	0.003*
	Business types	ODM (4.25)>OEM (3.54); OBM (4.69)>OEM (3.54); Design house (4.25)>OEM (3.54)	6.64	0.000*
	Organizational scales	11~20 persons (4.47)> below 10 persons (3.79)	5.11	0.003*
Product form design skills	Level of education	Graduate school (4.91)>High school (4.00); College (4.86)>High school (4.00); Junior college (4.93)>High school (4.00)	4.43	0.006*
2D software ability	Age groups	41~45 years (4.53)>26~30 years (3.60); 41~45 years (4.53)>31~35 years (3.71); Over 51 years (3.50)>26~30 years (3.60)	2.47	0.038*
3D software ability	Gender	Male (4.71)>Female (4.27)	2.12	0.037*
Machining knowledge	Level of education	Junior college (4.53)>college (3.91)	2.85	0.042*
Knowledge of marketing	Age groups	46~50 years (4.20)>31~35 years (3.29); Over 51years (3.50)>31~35 years (3.29)	2.53	0.034*
Creativity	Gender	Female (5.00)>Male (4.89)	3.16	0.002*
Team work	Business types	Design house (4.79)>OEM (4.25)	3.37	0.022*
	Organizational scales	11~20 persons (4.78)> below 10 persons (4.38)	3.65	0.016*

Notes: "*" represents reaching significance level of 0.05.

in enterprises with large numbers of employees place greater emphasis on the sketch ability and team work of new industrial designers, meaning that managers in different sized organizations require different team work abilities from newly hired industrial designers.

4.3. Job performance

Table 9 lists the overall situation of the job performance of newly recruited industrial designers. The overall average job performance score for new industrial designers is 3.66, falling in the range between fairly satisfied and very satisfied. This score indicates that managers are not extremely satisfied with the performance of newly hired industrial designers. Among job performance items, the top three criteria associated with higher levels of manager satisfaction are schedule control ability, aesthetic sense, and computer aided design software manipulating ability. Meanwhile, the criteria that managers are least satisfied with are free hand sketching, knowledge of engineering and manufacturing, and product planning abilities. This phenomenon exists because industrial designers are good at using computer software to assist in developing project proposals. These tools can reinforce product design efficiency, but may lead newly recruited industrial designers to neglect traditional free hand sketch skills. Additionally, considerable variety exists in the application of product texture and machining techniques. Newly recruited industrial designers should enrich their knowledge of engineering and manufacturing. It is also the case for product planning ability, and thus newly recruited industrial designers should strengthen their product planning ability.

Furthermore, table 10 lists the effects of different recruitment methods on industrial designer job performance. Face-to-face interview is indispensable for all recruitment methods. Therefore, a t-test is conducted to analyze the effects of portfolio check, project design, and written test. The test result demonstrates that portfolio checking significantly influences the performance of new industrial designers in terms of creativity, personal disposition, and schedule control ability. This phenomenon occurs because a portfolio often indicates designers work experience, sketches, and similar information which managers can use as a basis for selecting individuals with better work experience

and execution ability. Furthermore, the adoption of project design also leads to significant differences in the performance of new industrial designers in terms of product form skills, product planning abilities, and ability to use design software. In the procedure of the project design test, the manager frequently asks designers to perform practical design tasks such as idea sketches, rapid design, and computer graphics, so that the manager can select designers with better design ability who are better able to cope with work pressure. Finally, the written test also causes significant differences in the personal disposition of industrial designer. This phenomenon occurs because the result of attitude testing will reflect whether the personal disposition or character of the new industrial designer is suitable for product design.

Table 9 Descriptive analysis of the industrial designers' job performance

Item of job performance	Average	Std	Rank
Product form	3.92	0.97	1
Aesthetic sense	3.92	0.77	2
Ability to use design software	3.81	0.90	3
Personal disposition	3.76	0.82	4
Creativity	3.74	0.76	5
Product form	3.69	0.84	6
Ergonomic knowledge	3.57	0.68	7
Product planning ability	3.57	0.79	8
Knowledge of engineering and manufacturing	3.44	0.94	9
Free hand sketching ability	3.20	0.85	10
Total average	3.66	0.50	--

Table 10 The items of industrial designer's job performance that recruitment methods' effect reaches significant levels

Job performance	ANOVA for recruitment methods	t-value	P value
Product form	project design (3.78)>no project design (3.11)	4.61	0.001*
Creativity	portfolio check (3.96)> no portfolio check (3.69)	2.20	0.028*
Personal disposition	written test (3.86)> no written test (3.62)	2.38	0.018*
	portfolio check (3.98)> no portfolio check (3.71)	2.58	0.040*
Product planning ability	project design (3.62)> no project design (3.22)	2.83	0.005*

Ability to use design software	project design (3.85)> no project design (3.50)	2.22	0.028*
Schedule control ability	portfolio check (4.15)> no portfolio check (3.88)	2.32	0.023*
Average	portfolio check (3.80)> no portfolio check (3.63)	2.90	0.004*
	project design (3.70)> no project design (3.40)	2.72	0.009*

Notes: "*" represents reaching significance level of 0.05.

5. Discussions and suggestions

This study explored the methods and data used to recruit new industrial designers and their satisfaction with the job performance of newly recruited industrial designers. The relationship between the method used for recruiting new industrial designers and manager satisfaction with the job performance of newly recruited industrial designers was also explored. The survey results can provide a reference for managers, educators, and designers. The author reached the following conclusions.

(1) Besides the fact that all firms adopted face-to-face interviews in recruiting designers, 96.8% of them checked applicant portfolios. Additionally, 37.6% of the firms interviewed further by conducting written tests, with attitude and verbal tests being required for all newly recruited employees for the personnel resource sector. Only 16.1% of the companies interviewed adopted on the spot project design tests for ensuring the ability of newly hired industrial designers to meet the company requirements in the area of design work. About half of design departments in enterprises (46.9%) adopted written tests, while only some design houses (17.2%) used a written test. Only some design houses (51.7%) used on the spot tests to check applicant abilities in sketching and computer-aided design, and none of design departments in enterprises did.

(2) The five most important criteria in recruiting new industrial designers are creativity, product form design ability, design quality, awareness of design trends, and aesthetic sense; meanwhile, the five least important criteria are certificates of design skill, awards received,

specialties, knowledge of marketing, and educational background. Selection criteria differ significantly among managers with different backgrounds, firm scales and business types. As a result, industrial designers should improve their personal dispositions, such as teamwork, self-confidence, optimism, aggression, enthusiasm and their professional abilities to meet an enterprise's requirements.

(3) There exist significant differences in the property of enterprises and criteria. In terms of the titles of interviewed subjects: enterprise department chiefs, creativity managers, and senior designers place greater emphasis on the foreign language competence of new industrial designer than do managers in charge of design houses. In terms of level of education, managers with higher educational backgrounds are more concerned about the product form design ability and idea sketch ability, while lower educational backgrounds are concerned with the machining knowledge. In terms of gender, male managers tend to emphasize the 3D software abilities of prospective new designers more than female managers do, while female manages emphasize creativity. In terms of age groups, older managers tend to place a greater emphasis on the 2D software abilities of designers, as well as marketing knowledge. In terms of business types, managers in enterprises that aggressively design and develop new products, that is ODM and OBM business types, and managers in design houses, place greater emphasis on the sketching and team work abilities of new designers than do mangers in OEM business types. In terms of organization scale, managers in enterprises with large numbers of employees place greater emphasis on the sketch ability and team work of new industrial designers.

(4) Enterprise managers are not very satisfied with the job performance of newly hired industrial designers. The three items used to assess the performance of newly recruited industrial designers that managers are most satisfied with are schedule control ability, aesthetic sense, and ability to use design software; meanwhile, the three items that managers are least satisfied with are free hand sketching, knowledge of engineering and manufacturing, and product planning abilities. The field of design education should focus on these items and organize an appropriate curriculum to cultivate designers that will be more competitive in the human resource market.

(5) The written test causes significant differences in the personal dispositions of new industrial designer. On the spot design testing causes significant differences in the abilities of new industrial designers in product forming, product planning, and using design software. Consequently, depending on requirements, enterprise managers can adopt specific recruitment methods of combinations of different procedures for more effectively hiring excellent design talents.

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新進設計師招募方式與工作表現對設計教育的意涵

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摘要

設計部門往往不斷地招募新的設計師，主管如何在眾多應徵者中選擇優秀的人才以維持部門及企業的競爭力是重要的課題。本研究以問卷調查法探討台灣企業工業設計部門與設計公司招募新進設計師的方式、評選項目、業界主管對這些新進設計師之工作表現滿意度，以及招募新進設計師的方式與工作表現滿意度之關係。研究主要發現有：

(1) 招募新進設計師皆有面試的步驟。除了面試外，97%會再要求作品集。38%會再要求筆試，主要爲工業設計部門爲了配合人力資源部門所進行的性向或語文測驗。當場實際操作僅16%，主要是設計公司爲了測試新進設計師是否能勝任實際工作要求。

(2) 業界在招募新進工業設計師時，重視程度最高的前五項評選項目依序爲：創意度、造形能力、作品品質、觀察力、美學素養。重視度最低的五項評選項目爲：證照、得獎記錄、專長、市場行銷知識、學歷。且不同背景及企業屬性的主管在面試新進設計師時，對某些評選項目的重視程度有明顯差異。

(3) 業界主管對自己所招募新進工業設計師之工作表現未達非常滿意的程度。但表現較令人滿意的前三項依序爲：時程掌控、美學素養、電腦應用；表現最差的三個項目依序爲：徒手草圖、工程製造、產品企劃。且不同的招募方式，在某些工作表現的滿意程度上有明顯差異。

本研究結果除了可供業界主管在招募工業設計師時之參考，也可提供給設計教育界在安排課程及教學內容之參考，以培養出在職場上更有競爭力之設計師。

關鍵字：工業設計師、設計教育、人才招募方式、工作表現

壹、緒論

企業面對快速變化的環境，應變能力是很重要的。這種應變能力往往繫於企業中是否有優秀的人才，因此，現代企業的競爭可說是人才的競爭（Werther and Davis, 1993），優秀人才對於任務執行上具有正面性的意義，也影響到團體的工作成效（Drucker, 1964）。產品開發工作最需要的是集合精英，但是要發掘這樣的人才是非常不容易的，如果出現了這樣的人才就應該儘快想辦法網羅，勿使重要人才埋沒（Ulrich and Eppinger, 2000)。工業設計師在企業的產品開發程序中扮演關鍵性的角色，也是產品開發過程中最重要的資源。因此，Baxter（1995）認爲在推行產品開發策略時，適當的人選要在適當的時間安插在適當的職位上，否則所有規劃的努力、設備和經費將完全浪費。

由一項調查中發現，台灣在2004至2011年期間，工業設計人才將呈現供不應求情況（經建會，2003）。另依據中華民國工業設計協會（CIDA）的估算，台灣市場每年對工業設計人才的需求，共計約600~800位，相較於每年約1300多名畢業生投入市場，照理說應是相當足夠，但企業界還是反映人才難尋（翁政宇，2003）。明基設計中心總監王千睿（2003）感嘆，「在每年的畢業生當中，能馬上進入狀況的，恐怕不超過50人」，這顯示儘管有眾多人力湧入就業市場，但業界在找尋適合人才時還是有其困難性。從另一角度來看，在招募設計人才時，主管面對眾多的應徵者，必須有效地去判斷應徵者的適用程度，否則招募到不合適

的人才時，亦會產生很大的困擾。

目前針對工業設計師招募方式與工作表現之相關研究不多，但是恰當的招募方式對於挑選人才是非常重要的，也可能影響人才進入公司後的工作績效。因此，本研究以台灣設計主管爲對象，探討台灣企業設計部門與設計公司招募新進設計師的方式及評選項目，業界主管對這些新進設計師之工作表現滿意度，以及二者之關係。研究結果除了可供業界主管在招募工業設計師時之參考，也可提供給設計教育界在安排課程及教學內容之參考，以培養出在職場上更有競爭力之設計師。

貳、文獻探討

一、工業設計師之招募

招募是企業爲了吸引具有工作知識及能力的適當人選前來應徵的過程，因此企業爲了吸收到優秀人才須靠良好的招募程序和作業（Werther and Davis, 1993）。良好及謹慎的招募活動也會提升企業整體形象，讓應徵者感受企業用人的嚴謹態度，這對於企業有正面性的幫助，並且有宣傳的效果。DeCenzo and Robbins （1994）認爲招募過程包括有：初次面試篩選、申請表格填寫、僱用測驗、廣泛面談、背景調查、工作提供、身體檢查、永久性錄用等步驟。

Werther and Davis (1993) 將工業設計師招募方式歸納爲：(1)筆試：筆試的內容包含專業測驗、一般管理常識、智力測驗、企業認知測驗、以及語文測驗等。(2)面談：面談是招募程序中一項重要活動。好的面談，可以使企業獲得應徵者完整的資訊，也可使應徵者獲得真實的工作預告（Realistic Preview），能知道所有應徵工作的完整資訊。(3)實際操作：實際操作常被一般企業所忽略，然而對新進人員是否能早日進入工作狀況或勝任該項職務，卻是一個非常重要的過程。實際操作則是驗證應徵者能力的重要過程之一，雖然實行的過程較花費雙方時間，但面試者可從觀察應徵者操作的過程中去獲得特定的資訊，並由實際操作所產生的過程及結果作出評價。林俊雄（2002）的研究則具體指出台灣設計公司招募設計師時的方式可分爲：面試、審核作品集、以及實際操作三種方式，而其中的實際操作，是指對應徵者進行電腦操作、草圖繪製、快速設計等的測試。因此，本研究將招募新進設計師的方式分類爲：筆試、面試、審核作品集以及實際操作。

二、工業設計師應備知能

工業設計師在工作上須結合多種知識，鄧成連（1999）認爲，設計師不僅是執行者且是思考者，如裝飾者、執行者、問題解決者、催化者、解說者與使用者代言人等。Stark et al.（1986）提出專業人員應具備之條件，如表1所示。

表1 專業人員所應具備的能力與內涵

能力	內涵
概念能力	執行專業所需具備的基本知識
技術能力	執行專業所需具備的基礎技術能力
背景知識能力	對執行專業相關之廣泛有關社會、經濟和文化結構之了解
溝通能力	能透過多種符號方法與他人有效地溝通
整合能力	能在執行專業時整合概念、背景知識、技術和溝通等能力以做出有效決策
適應能力	能適應快速變革之科技社會與具動態本質之專業要求的各種狀況，並能將在校所學之專業能力應用於工作實務上
專業態度	求職之市場競爭性、專業識別、專業倫理、提昇專業的學術考量、持續學習動機

從專業人員所具備的要件來看工業設計師，在產品開發的過程中，工業設計師的專業知識不僅要熟知於設計及研發相關知識，也要了解開發前段的市場行銷決策，更要具備後段生產的基本知識，並擁有整合及溝通能力才能與其他部門合作，順利完成整個開發流程。在產品開發的過程中，工業設計師不僅要熟知設計相關技巧，也要了解市場行銷決策及生產的知識，並擁有整合及溝通能力（林俊雄，2002）。何信助（1996）提出設計人才最重要的六項能力有：創造思考、造形能力、設計表達、美學素養、評價能力、以及分析能力。葉枝龍（2002）進一步指出工業設計師應該具備的能力爲：問題界定能力、創造能力、產品企劃、價值判斷的能力、溝通及表達能力、CAID的應用能力、以及獨立進行專案的能力。葉雯玓（2000）也提出工業設計師最應具備的專業能力包括：電腦輔助設計能力、問題解決能力、創意、溝通協調能力、市場行銷知識、國際觀、造形設計能力、機構與結構設計能力、設計構想發展能力、以及產品企劃等。除了上述能力，王鴻祥（2001）強調應增列語言能力及人因工程知識，以滿足企業對於國際化及產品人因工程設計的需求。

Luh（2004）及楊旻洲（2002）亦分別對學界與業界的研究提出大學設計系畢業生所應具備之能力，指出企業認爲工業設計師應有的特質分爲素養（態度）與能力二類。素養包括有：團隊合作的精神、作品品質、自信心、對事物的好奇心、

美學素養、耐力與毅力。能力包括有：創造力的豐富性與獨特性、對事物的敏銳度與觀察力、構想草圖的描繪能力、口語的表達能力、產品分析企劃能力、獨立工作的能力、以及賦予產品適合的造形、色彩、質感之能力，如此，一個任職於企業的工業設計師必須擁有多種特質，才能融入企業的產品開發活動中。因此林俊雄（2002）之研究結果歸納設計公司招募新進設計師的評選項目除學歷、經歷及專長背景外及各項榮譽紀錄外，也需要注重工作熱忱、溝通協調、學習精神、合群度、草圖繪圖能力、創意度及造形美感，茲將各學者之觀點整理如表2。

表2 各文獻中有關招募新進設計師的評選項目

學者	評選項目
何信助 (1996)	創意能力、造形能力、表達溝通能力、 美學素養、產品分析能力
葉雯玓 (2000)	電腦軟體的運用能力、問題解決能力、創意能力、 表達溝通能力、市場行銷知識、造形能力
王鴻祥 (2001)	電腦輔助設計軟體的運用能力、問題解決能力、創意能力、 表達溝通能力、市場行銷知識、造形能力、 外語能力、人因工程相關知識
林俊雄 (2002)	產品分析能力、表達溝通能力、加工及製造知識、 市場及行銷知識
葉枝龍 (2002)	問題解決能力、表達溝通能力、2D軟體的運用能力、 3D軟體的運用能力
楊旻洲 (2002)	團隊合作的精神、作品品質、自信心、 對事物的好奇心、美學素養、學習精神、 耐力與毅力、手繪草圖能力、造形能力、 產品分析能力、設計構想表達溝通能力、加工及製造知識、 問題解決能力、觀察力、創意能力
林俊雄 (2002)	學歷、經歷、專長、證照、外語能力、得獎紀錄、 樂觀積極、工作熱忱
Luh (2004)	團隊合作的精神、作品品質、自信心、 對事物的好奇心、美學素養、學習精神、 耐力與毅力、草圖繪製能力、造形能力、 產品分析能力、表達溝通能力、生產加工製造知識、 設計問題解決能力、觀察力、創意能力

三、工業設計師工作表現的評估項目

工作表現是指「在從事體力或腦力活動時，將自己做事的能力及優缺點顯露出來」（Gerhart and Milkovich, 1990）。工作表現評估，係指企業內各級主管人員對

所屬員工之工作表現及其他有關情況，隨時予以考核紀錄，於屆滿一定期間再做正式的綜合考績評估（Jac, 1995）。工業設計師的工作內容特殊，所以評價之標準也不容易訂定（Ulrich and Eppinger, 2000）。例如，Chang and Chen（2000）認爲處理績效評估問題時，必須充分考慮產品開發工作的特殊性，若與製造部門或營業部門同樣處理是很不恰當的事。此外，程希哲（1998）指出台灣企業及設計公司對於設計師績效評估的方式主要是以「目標管理」爲主，強調設計成果的重要性。王鴻祥（2001）則提出七項初階設計人員工作能力評估項目，包括有：產品造形、徒手草圖、人格特質、產品企劃、工程製造、電腦應用、人因工程知識。林鑫保（1997）進一步提出新進工業設計師的工作成效評估方法，主要是以主管持續性的對於新進設計師所表現之工作品質、時效及工作目標的掌控做出評價，觀察新進設計師與其他成員是否能合作、工作的熱忱、美學素養、對於設計問題的分析和創新能力，以及執行能力。本研究以學者王鴻祥（2001）所提出初階工業設計師之專業能力指標中七個項目爲基礎，並參考林鑫保（1997）所提出工業設計師的工作成效評估方法，作爲探討新進工業設計師工作表現的評估項目，如表3說明。

表3 工業設計師工作表現的評估項目

項次	項目	說明
1	產品造形	處理產品外觀造形、色彩、材質與產品機能關係的能力
2	徒手草圖	以草圖表達構想快速性、清晰性與流暢性
3	設計創意	以創意思考發現與解決問題、整體創意表現
4	人格特質	凡事抱持積極樂觀態度與好奇心，並以團隊合作方式進行集體設計開發
5	美學素養	對於藝術、人文、時尚、流行敏銳度之賞析能力
6	產品企劃	以系統化與合理化方法解決問題
7	工程製造	能繪製最終造形與模型製作之工程圖，並具備製造程序與材料加工知識
8	電腦應用	能使用電腦工具繪製平面產品圖板，並運用電腦工具建構與配置立體產品造形、色彩與材質
9	人因工程知識	處理平面與立體產品操作介面的能力，整合人體尺寸與產品體積之間的相關性
10	時程掌控	能自我掌控工作目標與時效

參、研究方法

本研究採問卷調查法，主要進行步驟爲文獻探討、問卷設計、問卷調查、以及資料分析與討論。文獻探討之內容如前所述，包括工業設計師招募方式與評選項目，以及工業設計師工作表現的評估項目。問卷內容包含四部份：

(1) 第一部分爲受測企業之業務類型及招募方式調查，包含主要業務型態、設計部門組織規模、近期有無招募設計師、以及招募方式等。

(2) 第二部分爲招募新進工業設計師之評選項目的重視度。在問卷調查之前，本研究參考表2各學者之觀點，先請五位在業界資深且學有專精的設計主管進行焦點群體討論，歸納合併性質相似之評選項目，將招募新進設計師之評選項目分爲：背景經歷、專業能力、個人素養等三類評選構面，共27項評選項目，如表4所示。

表4 招募新進工業設計師之評選項目

評選構面	評選項目
背景經歷	(1)學歷、(2)經歷、(3)專長、 (4)證照、(5)外語能力、(6)得獎紀錄
專業能力	(7)草圖能力、(8)造形能力、(9)產品分析能力、 (10)表達溝通能力、(11)人因工程知識、(12)2D軟體的運用能力、 (13)3D軟體的運用能力、(14)加工製造知識、(15)市場行銷知識、 (16)問題解決能力、(17)觀察力、(18)創意度
個人素養	(19)團隊合作的精神、(20)作品品質、(21)自信心、 (22)對事物的好奇心、(23)美學素養、(24)樂觀積極、 (25)工作熱忱、(26)學習精神、(27)耐力與毅力

問卷設計採用李克特尺度（Likert scale）作爲填答者主觀感受之測量方式，量表由左至右分別給予1到5的評分，數值1代表該評選項目「非常不重要」、數值2代表該評選項目「不重要」、數值3代表該評選項目「普通」、數值4代表該評選項目「重要」、數值5代表該評選項目「非常重要」。

(3) 第三部分爲新進工業設計師之工作表現調查，請受測主管針對該部門新進初級設計師於該公司的工作表現分別進行評估，包含產品造形、徒手草圖、設計創意、人格特質、美學素養、產品企劃、工程製造、電腦應用、人因工程知識以及時程掌控等10項。亦採用李克特尺度作爲填答者主觀感受之測量方式，量表由左至右分別給予1到5的評分，分別爲「非常不重要」、「不重要」、「普通」、「重要」、以及「非常重要」。

(4) 第四部分爲受測主管之基本資料，包括性別、年齡、教育程度及職稱。問

卷正式調查前，先請10位在業界資深且學有專精的設計主管進行測試，發現問卷之內容並無不妥之問項，僅需修正問卷文字描述不清之處。

問卷調查時間從2004年2月至3月，問卷採郵寄方式以登錄於外貿協會設計推廣中心名錄之91家產品設計服務公司（經濟部，2003），104求職網站（2003）有招募工業設計師的企業200家，以及2001年度天下雜誌（2001）登錄之1000大製造業中，篩選以製造消費性或資訊實體產品爲主的140家公司爲樣本。寄發對象爲這些企業中擔任設計主管職之人士，且擁有面試新進工業設計師之經驗者，並將新進工業設計師定義爲：「擁有工業設計學士學位，不到兩年實務工作經驗資歷的設計師」。共寄發431份問卷，問卷寄發後以電話與郵寄明信片的方式反覆跟催，以提高回收率。最後回收有效問卷共93份，回收率爲21.6%。在信度檢定方面，本研究以各問項之內部一致性分析（Internal consistency analysis）來檢定各問項其內部之一致性。分析結果，評選項目問項之整體Cronbach'α值達0.8190；工作表現問項之整體Cronbach'α值達0.8828，均具有相當之可信度，可進行後續的分析與討論。茲將受測樣本之背景資料整理如表5。

表5 受測樣本之背景項目統計

項目	屬性變項	人數	百分比(%)	項目	屬性變項	人數	百分比(%)
性別	男	82	88.17	職稱	公司負責人	18	19.35
	女	11	12.90		部門主管	37	39.78
年齡	25-30歲	15	16.10		設計總監	17	18.27
	31-35歲	21	22.58		資深設計師	21	22.58
	36-40歲	31	33.33	業務類型	OEM爲主	28	30.10
	41-45歲	19	20.43		ODM爲主	28	30.10
	46-50歲	05	05.37		OBM爲主	13	13.98
	51歲以上	02	02.15		設計公司	24	25.81
教育程度	高中（職）	02	02.15	組織與規模	10人以下	53	56.98
	專科	15	16.12		11-20人	36	38.70
	大學	44	47.31		21-30人	03	03.22
	研究所	32	34.40		31-40人	00	00.00
					41人以上	01	01.07

肆、研究結果與分析

一、招募方式

業界招募設計師時通常是採用二步驟的招募方式，由表6可以得知各種招募方式中，招募新進設計師100%皆有面試的步驟，除了面試外，97%會要再檢視應徵者之作品集，38%會再進行筆試，這些進行筆試者主要爲了配合人力資源部門之要求所進行的性向及語文測驗。而除了面試外，會再進行實際操作的樣本僅有16%，這些進行實際操作者主要爲了測試新進設計師是否能滿足自己公司之工作任務。

表6 受測樣本企業招募方式統計

招募方式	企業設計部門 (n=64)	設計公司 (n=29)	總數 (N=93)
面試	64 (100.0%)	29 (100.0%)	*93 (100.0%)*
作品集審查	61 (95.3%)	29 (100.0%)	*90 (96.8%)*
筆試	30 (46.9%)	5 (17.2%)	*35 (37.6%)*
實際操作	0 (0.0%)	15 (51.7%)	*15 (16.1%)*

二、評選項目

進一步由表7得知業界招募新進工業設計師較重視的前五項評選項目依序是：創意度、造形能力、作品品質、觀察力以及美學素養。重視程度最低的五項爲：證照、得獎紀錄、專長、市場行銷知識以及學歷。

再由整體評估構面觀察，可得知業界最重視的評選構面爲「個人素養」，平均值達4.53，屬於「重要」的程度以上。其次爲「專業能力」，平均值達4.33，其中除了2D軟體運用能力、人因工程知識及市場行銷知識之平均值在3.9~3.0之間，屬於「普通~重要」的程度，其餘評選項目都屬於「重要」程度以上。「背景經歷」的平均值爲3.54，其中除了「證照」平均值<2.92，屬於「普通~不重要」的程度，其餘評選項目都分佈於「普通~重要」的程度。可見企業希望從眾多的應徵者中，挑選出富有個人素養、專業能力且能配合企業工作任務之人才；而「證照」項目的重

表7 評選項目與構面之重要性統計

評選構面	評選項目	平均值	標準差	排名	評估構面		
					平均值	標準差	排名
背景經歷	學歷	3.71 #	0.68	23	3.54	0.34	3
	經歷	3.71	0.70	21			
	專長	3.60 #	0.70	25			
	證照	2.92 #	0.61	27			
	外語	3.71	0.72	22			
	得獎紀錄	3.57 #	0.75	26			
專業能力	草圖能力	4.22	0.88	16	4.33	0.27	2
	造形設計能力	4.90 *	0.31	2			
	產品分析能力	4.23	0.71	15			
	表達溝通能力	4.25	0.64	14			
	人因工程知識	3.79	0.67	20			
	2D軟體的運用能力	3.95	1.00	19			
	3D軟體的運用能力	4.68	0.63	7			
	加工製造知識	4.03	0.83	17			
	市場行銷知識	3.69 #	0.74	24			
	問題解決能力	4.57	0.59	10			
	觀察力	4.78 *	0.43	4			
	創意度	4.92 *	0.28	1			
個人素養	團隊合作的精神	4.56	0.65	11	4.53	0.34	1
	作品品質	4.84 *	0.39	3			
	自信心	4.01	0.75	18			
	對事物的好奇心	4.30	0.70	13			
	美學素養	4.74 *	0.49	5			
	樂觀積極	4.38	0.62	12			
	工作熱忱	4.61	0.58	9			
	學習精神	4.70	0.48	6			
	耐力與毅力	4.61	0.61	8			

註：“*”表示平均數前5名；“#”表示平均數後5名

視程度最低，則可能是因台灣工業設計師並沒有專業證照制度，所以業界對於新進設計師證照的重視度相對較低。

利用t檢定與單因子變異數分析(ANOVA)來檢定受測樣本及企業類型變項與

評選項目之關係，其中性別採t檢定，年齡、教育程度、職稱、企業型態、組織規模等變項採ANOVA分析，以了解各變項在評選項目上是否有顯著性差異。經由檢定之F值及p值，分析是否達顯著之差異，再利用適用於比較不同人數族群的Scheffé多重比較法，進行各變項兩兩之間的比較，以了解其顯著差異之趨向（McCall, 1998）。

由表8可以得知，在職稱方面，企業的部門主管、設計總監及資深設計師較設計公司的負責人傾向重視新進設計師的「外語能力」，這現象顯示企業內的設計部門可能較設計公司的設計師更重視國際化及全球市場的產品設計需求，因此在語言能力上的重視度較高。在教育程度方面，學歷愈高的主管愈傾向重視新進設計師的「造形能力」及「草圖繪製能力」等二項設計技巧，顯示學歷愈高的主管可能對新進設計師的設計技巧要求也愈高。在性別方面，男性較女性主管更傾向重視新進設計師的「3D軟體的運用能力」；女性較男性主管傾向重視新進設計師的「創意度」，這現象顯示男性可能較女性主管重視設計師的技術表

表8 樣本、企業屬性變項與評選項目達顯著性差異彙總表

評選項目	屬性項目	平均數差異比較	t或F值	p值
外語	職稱	部門主管(3.95)>設計公司負責人(3.28); 設計總監(3.71)>設計公司負責人(3.28); 資深設計師(3.62)>設計公司負責人(3.28)	3.77	0.016*
草圖能力	教育程度	研究所(4.38)>專科(3.33); 大學(4.16)>專科(3.33)	4.93	0.003*
	業務類型	ODM(4.25)>OEM(3.54); OBM(4.69)>OEM(3.54); 設計公司(4.25)>OEM(3.54)	6.64	0.000*
	組織規模	11~20人(4.47)>10人以下(3.79)	5.11	0.003*
造形能力	教育程度	研究所(4.91)>高中(4.00); 大學(4.86)>高中(4.00); 專科(4.93)>高中(4.00)	4.43	0.006*
2D軟體的運用能力	年齡	41~45歲(4.53)>26~30歲(3.60); 41~45歲(4.53)>31~35歲(3.71); 51歲以上(3.50)>26~30歲(3.60)	2.47	0.038*
3D軟體的運用能力	性別	男性(4.71)>女性(4.27)	2.12	0.037*
加工製造知識	教育程度	專科(4.53)>大學(3.91)	2.85	0.042*
市場行銷知識	年齡	46~50歲(4.20)>31~35歲(3.29); 51歲以上(3.50)>31~35歲(3.29)	2.53	0.034*
創意度	性別	女性(5.00)>男性(4.89)	3.16	0.002*
團隊合作的精神	業務類型	設計公司(4.79)>OEM(4.25)	3.37	0.022*
	組織規模	11~20人(4.78)>10人以下(4.38)	3.65	0.016*

註：“*”表示p值達0.05之顯著水準。

現，而女性可能較男性主管重視設計師的創意表現。在年齡方面，年齡層較高的主管較傾向重視新進設計師的「2D軟體的運用能力」及「市場行銷知識」，顯示年齡較高的主管可能較傾向要求新進的設計師進行2D繪圖表現以及具有行銷策略性的設計作品構想表達。在業務類型方面，有積極進行產品設計開發活動，包括有產品是屬於ODM、OBM業務類型、以及設計公司的主管，比起較積極進行產品製造活動，即產品是OEM業務類型的主管，更傾向重視新進設計師的「草圖能力」及「團隊合作精神」，這結果顯示主管可能會依據設計業務類型的不同而對新進設計師有不同的設計能力要求。在組織規模方面，成員數愈多的組織主管愈傾向重視新進設計師的「草圖能力」及「團隊合作精神」，這也意味著主管們可能會依據組織成員數的多寡而對新進設計師有不同的團隊合作工作表現要求。

三、工作表現

由表9可以得知新進工業設計師在工作表現的情況。由於整體平均值爲3.66，屬於「普通滿意~滿意」的分數區間，顯示新進設計師整體的工作表現可能在主管心目中未達「非常滿意」的程度。但是，在各項工作表現中，滿意程度較高的前三項依序爲：時程掌控、美學素養、以及電腦應用。滿意程度最差的前三項目依序爲：徒手草圖、工程製造、以及產品企劃。探討原因可能爲設計師較擅長

表9 設計師工作表現描述性統計分析

工作表現項目	平均值	標準差	排名
時程掌控	3.92	0.97	1
美學素養	3.92	0.77	2
電腦應用	3.81	0.9	3
人格特質	3.76	0.82	4
設計創意	3.74	0.76	5
產品造形	3.69	0.84	6
人因工程知識	3.57	0.68	7
產品企劃	3.57	0.79	8
工程製造	3.44	0.94	9
徒手草圖	3.20	0.85	10
整體平均值	3.66	0.50	--

以電腦軟體作爲輔助工具來進行設計與提案，這些輔助工具有效地強化產品設計的效率，但也因此可能造成新進設計師較忽略傳統手繪草圖的技巧。另外，當今的產品材質應用廣泛，加工技術也比以往的產品更有變化，因此新進設計師對於工程製造的知識及觀念方面需要再加強累積經驗。在產品企劃方面，由分析結果也發現新進設計師對於產品的企劃能力有待加強。

進一步由表10可以看出各種招募方式對設計師工作表現的影響。由於在各種招募方式中，面試爲一定有的步驟。因此，本研究分別對作品集審查、實際操作以及筆試三個項目進行t檢定分析。

表10 招募方式影響設計師工作表現達顯著性差異彙總

工作表現	招募方式平均數差異比較	t值	p值
產品造形	有實際操作(3.78)>無實際操作(3.11)	4.61	0.001*
設計創意	有作品集審查(3.96)>無作品集審查(3.69)	2.20	0.028*
人格特質	有筆試(3.86)>無筆試(3.62)	2.38	0.018*
	有作品集審查(3.98)>無作品集審查(3.71)	2.58	0.040*
產品企劃	有實際操作(3.62)>無實際操作(3.22)	2.83	0.005*
電腦應用	有實際操作(3.85)>無實際操作(3.50)	2.22	0.028*
時程掌控	有作品集審查(4.15)>無作品集審查(3.88)	2.32	0.023*
各項目平均值	有作品集審查(3.80)>無作品集審查(3.63)	2.90	0.004*
	有實際操作(3.70)>無實際操作(3.40)	2.72	0.009*

註：“*”表示p值達0.05之顯著水準。

結果發現採用作品集審查，比起無作品集審查的招募步驟，對日後新進設計師在設計創意、人格特質、時程掌控方面的表現上，有顯著差異。原因可能爲作品集中往往包含設計師的各項經歷、草圖、設計作品等資料，可以提供主管豐富的資訊，而主管可以從這些資訊中選擇工作經歷及創意執行能力較理想的設計師。

其次，有採用實際操作，比起無採用實際操作的步驟，對日後新進設計師在產品造形、產品企劃、電腦應用方面的表現上，有顯著差異。推測原因爲在實際操作的過程中，主管往往會要求設計師進行構想草圖、快速設計、電腦繪圖等實際的工作內容，因此實際操作的步驟可以讓主管從中觀察並選擇設計能力及面對工作壓力時表現較佳的設計師。

而採用筆試，比起無採用筆試的步驟，對日後新進設計師在人格特質的表現上，有顯著差異。原因可能爲筆試中的性向測驗結果會顯現新進設計師的人格特質，主管可以從中參考挑選性格或性向較適合的人才。

伍、討論與建議

本研究探討招募新進設計師的方式、評選項目、業界主管對這些新進設計師之工作表現滿意度，以及招募新進設計師的方式與工作表現滿意度之關係，以提供業界主管、設計教育者及設計師參考。研究結論與建議如下：

(1) 招募新進設計師皆有面試的步驟。除了面試外，97%會要再求作品集，38%會再要求筆試，當場實際操作則爲16%。不同的招募方式，在某些工作表現的滿意程度上有明顯差異。採用作品集審查對日後新進設計師在設計創意、人格特質、時程掌控方面的表現上有顯著差異；採用筆試，對設計師在人格特質的表現上有顯著差異；有採用實際操作，則對設計師在產品造形、產品企劃、電腦應用方面的表現上有顯著差異。因此業界主管招募新進設計師時，可以針對未來工作的內容需要，分別採用不同組合的招募步驟，應可以較爲客觀而有效率地獲得優秀人才。

(2) 業界在招募新進工業設計師時，重視程度最高的前五項評選項目依序爲：創意度、造形能力、作品品質、觀察力、美學素養。重視度最低的五項評選項目爲：證照、得獎記錄、專長、市場行銷知識、學歷。且不同背景及企業屬性的主管在面試新進設計師時，對某些評選項目的重視程度有明顯差異。因此，設計師除了必須加強本身的專業能力外，必須注重團體合作、自信心、樂觀積極、工作熱忱等個人素養的增進，以適應企業的要求。

(3) 業界主管對自己所招募新進工業設計師之工作表現未達非常滿意的程度。但表現較令人滿意的前三項依序爲：時程掌控、美學素養、電腦應用；表現最差的三個項目依序爲：徒手草圖、工程製造、產品企劃。設計教育界對這些表現較差項目，可以在安排課程及教學內容時予以改進，以培養出在職場上更有競爭力之設計師。

(4) 由研究結果顯示業界招募新進工業設計師時評選項目重視度最高的前五項爲：創意度、造型設計能力、對自我作品品質的要求度、觀察力、藝術美學素養。所以當今新進設計師除了加強本身的專業能力外，更需注重個人素養，企業希望設計人才不僅具備專業能力外，也能與不同職性的團隊合作，所以必須具備學習精神、樂觀積極、自動自發，及以團體合作爲重的工作熱忱，這樣的人才在工作表現上才能具備良好的績效。

(5) 徒手草圖在設計流程中，是經濟快速的溝通工具，影響到設計構想水平發展的速度及廣度，也是屬於設計師該具備的基本專業能力；而電腦輔助設計則可加快產品研發垂直整合的速度，其彩色模擬的效果及速度都優於傳統的繪圖媒體。近年各設計科系因應業界的需求，開始增設電腦輔助設計的課程，某些科系甚至將徒手繪圖的課程由必修改爲選修，造成設計新鮮人的電腦軟體應用能力增強，手繪草圖能力卻退步的現象。建議學界在培養學生電腦軟體應用能力的同時，也要同時要求基本的草圖手繪能力。

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